RESEARCH HIGHLIGHT

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CANADIAN HOUSING FIRE STATISTICS

Introduction

The project, completed under the CMHC External Research Program, develops benchmarks and indicators related to fire losses in housing in Canada that provide a better understanding of fire risk in Canadian housing. This statistical information on fire can assist in defining both the frequency (fire incidence) and consequences (fire deaths, injuries, damage) components which define fire risk. The project focused primarily on issues that could affect long-term and short-term Canadian housing policy related to fire safety.

The objectives for the project were first to provide Canadian statistical benchmarks for fire safety in housing, including First Nations' housing, that can be used in examining future policy decisions on fire safety and housing, and, secondly, to provide recommendations for Canadian housing fire loss data that should be collected by the agencies that assemble this data. This project compared statistics on fire loss data collected by various agencies in Canada and the numbers and relevant characteristics (from a fire risk viewpoint) of housing collected as part of the Census of Canada.

Findings

Canadian fire statistics show that the greatest numbers of fires and life losses and injuries occur in residential buildings, especially one- and two- family dwellings. Annually fires in residential units account for 70-80 per cent of Canadian fire deaths and 60-70 per cent of fire injuries. Given the high portion of total fire losses attributed to residential fires, there have been numerous calls, over the past decades, for codes to require additional fire safety measures in residential units. This project studied the fire losses that have occurred since the introduction of requirements for smoke alarms in the National Building Code of Canada in the early 1980s to determine the impact of this change, and the concurrent public information campaign, on fire safety in Canadian housing.

Statistical Benchmarks

When examining fire loss statistics for residential units, there are typically four high-level components for which data are collected: fire incidence, fire deaths, fire injuries and fire damage. This report examined the impact of fire in residential units using these four components and related these components to benchmarks based on population, numbers of residential units and fire incidence. As well, these components were related to other indicators which included residential unit type, ages of victims, urban-rural locations, household size and crowding, household age and condition and ignition scenarios.

In overview, the research identified that housing fire incidence and losses have, for the most part, decreased since 1980. One important finding was that fire death and injury rates are still decreasing appreciably using 5-year averages while fire damage rates are increasing slightly.

- ***Population Benchmark*** - This most commonly used benchmark examined fire incidence and losses on the basis of a given population occupying residential units. This benchmark showed that Canadian fire incidence, deaths and injuries have significantly fallen over the 20-year study period whereas fire damage has remained approximately constant.
- ***Residential Units Benchmark*** - This benchmark examined fire incidence and losses on the basis of the number of residential units in Canada. The Residential Units Benchmark showed a greater reduction in fire incidence and fire deaths and a comparable reduction in fire injuries compared to the Population Benchmark. It also showed a slight reduction in fire damage over the 20-year period.

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Table 1-Numbers of Canada-Wide and First Nations' Residential Units 1971 - 1996				
Year	**Canada**	**Index (1971 = 100)**	**First Nations**	**Index (1981 = 100)**
1971	6,030,805	100.0	N/A	N/A
1976	7,166,055	118.8	N/A	N/A
1981	8,281,535	137.3	47,180	100.0
1986	8,991,670	149.1	56,084	118.9
1991	10,018,265	166.1	67,282	142.6
1996	10,820,050	179.4	80,443	170.5

- ***Fire Incidence Benchmark*** - This benchmark examined fire losses on a per fire basis. While often considered a measure of fire risk (deaths, injuries, damage/fire), it has a basic shortcoming in that the fire incidence rate is the governing criterion. It is suspected that the number of reported fires used in this benchmark has decreased over time, as more fires are not reported since code requirements for smoke alarms have led to earlier fire discovery and extinguishment. As such, the Fire Incidence Benchmark may generate an unduly high rate of deaths, injuries and damage on a per fire basis because only the more severe fire incidents are reported. Using the Fire Incidence Benchmark shows that the fire death rate has decreased over the 20-year period while fire injury and damage rates (constant dollars) have increased. It is suggested that this benchmark not be used extensively in determining fire risk unless improved reporting of all fires can be achieved.

Application of the Statistical Benchmarks

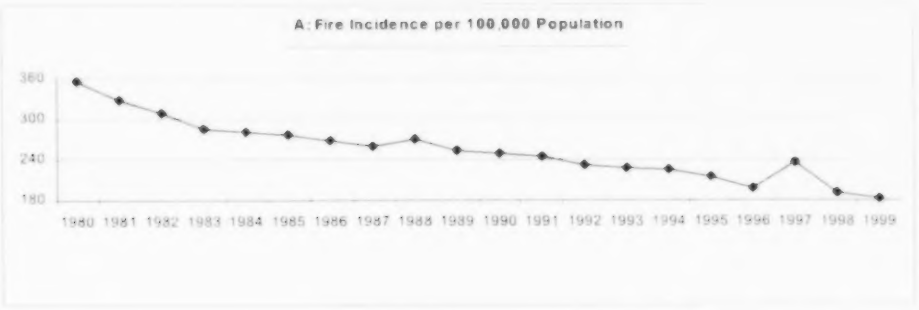
First Nations - Using the three basic benchmarks, the First Nations' fire incidence and losses in residential units were compared to the Canada-wide figures. Using the Population Benchmark, the First Nations' fire death rate is approximately four times the Canada-wide rate whereas the fire incidence and injury rates were lower than the Canada-wide rate. Fire damage per capita was comparable. Comparing First Nations to the Northwest Territories rates, based on population, showed that the First Nations had comparable fire death rates and lower fire incidence, injuries and damage rates. Using the Residential Units Benchmark provided a different picture. Comparing First Nations to Canada-wide figures shows that the fire incidence is more than twice the Canada-wide rate, the fire death rate is almost 8.8 times and the fire injury and damage rates are approximately twice the Canada-wide rates. Using the Fire Incidence Benchmark, the First Nations' fire death rate is 4.4 times the Canada-wide rate and the injury and damage rates are comparable. Given the suspect fire incidence data, this latter benchmark result is also suspect.

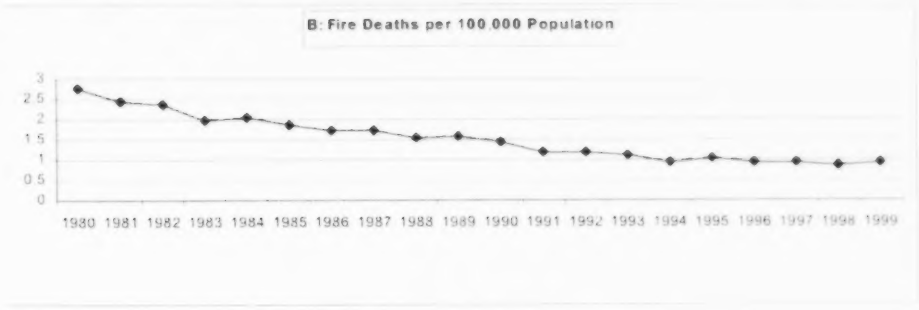
Comparing fire losses in only one- and two- family dwellings for Canada-wide and First Nations (based on numbers of units) showed that the First Nations' fire incidence rate is 2.4 times the Canada-wide figure; the injury rate is 2.5 times; the damage rate is 1.7 times; and the fire death rate is 10.4 times. This last figure is considered to be reasonably reliable and points out the significantly higher fire death rate in First Nations' housing. Two other indicators point to possible reasons for the higher First Nations' losses. The first is remote location in which it was shown that rural locations have higher losses than urban areas. The second was crowding in which it was shown that crowding conditions lead to higher fire death rates.

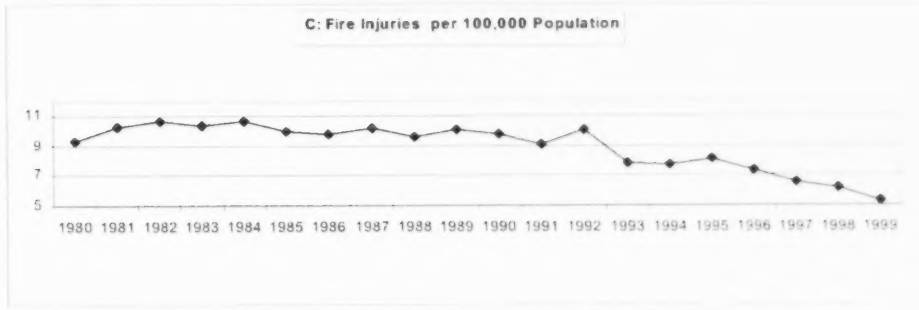
Residential Unit Type - This examination compared fire incidence and losses for one- and two- family dwellings, rooming and lodging houses, mobile homes and apartments. The comparison showed that the fire incidence and loss rates for apartments and one- and two- family dwellings were essentially the same (apartments were slightly lower), whereas rooming and lodging houses had fire death and injury rates 11 to 12 times the rate for one- and two- family dwellings. The mobile home fire death rate was approximately six times the one- and two-family dwelling rate.

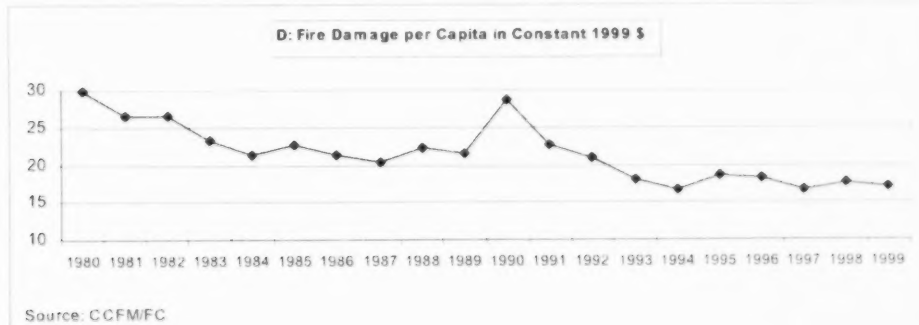
Ages of Victims - In examining ages of victims as a potential indicator, it was found that the rates of fire deaths for persons 65 years of age and over were approximately twice what would have been expected, based on their percentage of the population. Different groupings of ages for children by province made it impossible to determine any trends on a Canada-wide basis from that data.

Urban-Rural Location - This indicator shows that the rates of fire deaths, in particular, for rural locations, were 1.5 to 4.3 times the rates for urban locations, using community size as a basis.









Source: CCFM/FC

Household Size and Crowding - While this examination provided some information on "crowding" as a measure of fire risk, the results related to household size alone were inconclusive due to only small provincial variations. The crowding trend line shows a slight increase in fire incidence with increased incidence of crowding and a significant increase in fire death rates.

Household Age/Condition - This examination looked at the age of a dwelling and its physical condition as a means of establishing fire risk. Using dwelling age showed a slight increase in fire incidence with age. A greater increase in fire incidence was noted, however, in plotting householders' perceptions of need for repairs against fire incidence. Plotting the fire death rates against Age of Units and perception of need for repairs showed that while the deaths per 1,000 fires and per 1,000 residential units decreased with increasing median age, the deaths per 1,000 fires increased slightly with the increased homeowner perception of need for major repair.

Ignition Scenarios - This indicator showed that, over the 20-year study period, most fires caused by building-related sources of ignition have decreased at approximately the same rate as the decrease in all fires, however, fire exposure from external fires as a source has

increased. This indicator shows, using 5-year averages, that cooking equipment as an ignition source has dropped 23 per cent over the 20-year period, heating equipment 39 per cent and electrical equipment and appliances 23 per cent. External fire exposure has increased 22 per cent over the same period. From the cause of fire perspective, construction, design and installation deficiency has decreased 17 per cent while mechanical, electrical failure or malfunction has decreased 48 per cent.

Pre-Post-1980 Differences - In looking at the changes to residential units that could have resulted in increased fire safety, the requirements for smoke alarms in new buildings, around 1980, in existing buildings in approximately 1985 and the accompanying public information campaign, constitute the single most determining factor. Examining fire incidence and deaths as compared to the percentage of pre-1981 residential units in Figure 16 of the report, shows that fire incidence and deaths both increase as the portion of pre-1981 housing increases. What is not known is the number of pre-1981 units where owners may have voluntarily installed smoke alarms or those which added smoke alarms as a result of retroactive National Fire Code requirements. The research showed the dramatic change in fire deaths per 100,000 residential units starting in 1980 and continuing through 1999. That rate dropped approximately 25 per cent by 1984 and 75 per cent by 1999. The fire injuries rate dropped by approximately one third over the period 1980-1999. In constant dollars, fire damage rates per residential unit increased through 1984 and dropped 41 per cent by 1999.

Conclusion

In seeking and analyzing data from various sources, the authors occasionally found that there was no direct means to conduct a detailed investigation due to lack or absence of data. The authors, therefore, recommend some additions to or improvements in current data collection to allow a more complete review and analysis of fire losses in housing. Subjects in which improvements in reporting are recommended include First Nations, Fire Incidence, Housing Details, Ages of Victims, Age of Housing and Fatal Fires.

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